REMARKS

Favorable reconsideration of this Application as presently amended and in light of the following discussion is respectfully requested.

After entry of the foregoing Amendment, Claims 2-7, 9-15, 17-20 and 24-28 are pending in the present Application. Claims 2-4, 9 and 17 are recast in independent form. No new matter has been added.

By way of summary, the Official Action presents the following issues: Claims 5-7, 14, 18, 20 and 21-28 stand rejected under 35 U.S.C. § 102 as being anticipated by Espax et al. (U.S. Patent No. 6,373,433, hereinafter "Espax"); Claims 6, 7, 14, 18 and 21-26 stand rejected under 35 U.S.C. § 102 as being anticipated by Greenstein et al. (U.S. Patent No. 6,131,016, hereinafter "Greenstein"); Claims 8 and 19 stand rejected under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax and further in view of Minami et al. (U.S. Patent No. 6,587,510, hereinafter "Minami"); Claims 15 stands rejected under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax in further view of Ocenasek et al. (U.S. Patent No. 6,674,324, hereinafter "Ocenasek"); and Claims 2-4, 9-13 and 17 are objected to as being dependent upon a rejected base claim.

Applicants appreciatively acknowledge the indication of allowable subject matter recited in Claims 2-4, 9-13 and 17. However, as Applicants submit that the independent claims patently define over the applied references, these dependent claims are maintained in their present form.

REJECTION UNDER 35 U.S.C. § 102

The outstanding Official Action has rejected Claims 5-7, 14, 18, 20 and 21-28 under 35 U.S.C. § 102 as being unpatentable over Espax. The Official Action contends that Espax discloses all of the Applicants' claimed features. Applicants respectfully traverse the rejection.

Applicants' Claim 24, recites, *inter alia*, a method for transmitting orthogonal frequency division multiplex (OFDM) symbols to be transmitted by using a plurality of OFDM subcarriers in an OFDM transmission system, the method including:

> . . . obtaining subcarrier channel response vectors corresponding to said plurality of antenna elements, wherein each of said subcarrier channel response vectors has subcarrier related elements corresponding to said plurality of subcarriers, and
>
> applying weighting value to each of said plurality of subcarriers of said OFDM symbols in accordance with a complex conjugate of said obtained subcarrier channel response vectors. (emphasis added)

Espax describes a communication system including a first communication device (1) and a second communication device (2) that communicate via a wireless link (3). The communication devices communicate via an OFDM multi carrier modulation scheme.[1] The transmission path embodied by wireless link (3) will have a characteristic channel response which will affect the amplitude and phase of each sub-carrier transmitted from the communication device (1). In this regard, the communication device (1) is configured to generate probe symbols for reception and analysis by the second communication device (2) the probing symbols are provided to a controller (18) by the second communication device (2) to determine an optimum weight for each subcarrier corresponding to the transmitted probe symbols. In this way, the communication device (2) can select those sub-carriers whose received signal quality is comparatively poor. A channel estimator (19) estimates the channel response of the transmit path by analysis of the received probe symbol transmissions.[2] The subbands containing the selected sub-carriers having poor quality are in this way identified via a transmission from a transmitter (14) of communication device (2) to communication device (1) and include a request for probing signals on just one sub-carrier in each selected subband. The communication device (1) responds to communication device (2)

[1] See Espax at column 4, lines 12-29.
[2] See Espax at column 5, line 30-67.

by transmitting probe signals including pilot symbols in order to probe the wireless link (3) for all the antennas (4-6) in the sub-band specified by the communication device (2).[3]

Conversely, in an exemplary embodiment of the Applicants' claimed advancements, a method of transmitting orthogonal frequency division multiplex (OFDM) symbols transmitted using a plurality of OFDM subcarriers in an OFDM transmission system, is provided. OFDM symbols are generated to be transmitted by using a plurality of antenna elements. Subcarrier channel response vectors are obtained corresponding to the plurality of antenna elements. Each of the subcarrier channel response vectors has subcarrier related elements corresponding to the plurality of subcarriers. A weighting value is applied **to each of the subcarriers of the OFDM symbols** in accordance with a complex conjugate of the obtained subcarrier channel response vectors.

As can be appreciated, as Espax only adjusts sub-carriers of **probed sub-bands**, which have been identified through an exchange of signals between a communication device (1) and a communication device (2) for identifying poor quality sub-carriers. Espax does not disclose or suggest applying a weighting value to each of said plurality of subcarriers of said OFDM symbols in according with a complex conjugate of the obtained subcarrier channel response vectors as recited in Applicants' claims.

In the Official Action of April 20, 2007 under the heading "Response to Arguments" the Official Action noted that:

> However, [Espax] teaches that the reason to apply the same weight adjustment for each sub-band rather than for every selected sub-carrier is to keep the transmission overhead low. See col. 6, lines 21-25. [Espax] goes so far as suggesting that only a sub-band containing the most badly affected sub-carriers could be processed, obviously at the expense of lower quality signal transmission. From this, one can easily see the reason that those sub-bands containing sub-carriers having poor quality are identified for transmitting probing signals on those selected sub-carriers rather than simply transmitting probing

[3] See Espax at column 6, lines 5-12.

> signals on all the sub-carriers. The latter would have produced better quality signals, but at an increased transmission overhead. By disclosing an improved method of applying weights to sub-carriers at a reduced transmission overhead, the patent implicitly teach or at least suggest measuring the channel response of all the sub-carriers and applying weight to each of the sub-carriers.....

As noted above, this rebuttal, if anything, illustrates that Espax teaches away from the Applicants' claimed advancements. "A reference may be said to teach away when a person of ordinary skill in the art, upon reading the reference, **would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.**" *In re Gurley*, 31 U.S.P.Q.2d 1130, 1131 (Fed. Cir. 1994) (emphasis added). Further, it is noted that, "disclosures in the references that diverge from and teach away from the invention cannot be disregarded", Phillips Petroleum Company v. U.S. Steel Corp., 9 U.S.P.Q.2d 1461 (Fed. Cir. 1989).

For example, the weight adjustment performed by the Espax reference is performed for each probed sub-band. The application of the weight adjustment to probed sub-bands is a key aspect of this reference which clearly **diverges** from the teachings of the Applicants' claimed advancements. In operation, the Espax reference transmits a OFDM signal by analyzing for each subcarrier, the quality of a received signal burst.[4] In response, the receiver selects the subcarriers with a poor signal quality and identifies the sub-band containing the selected subcarriers with a poor signal quality.[5] The transmitter then sends probing/pilot signals in the identified sub-bands. On the basis of the probing/pilot signal, the receiver determines one weight adjustment value for each probed sub-band.[6] As pointed out in the Official Action as only weight adjustment value is provided for each sub-band rather than for every selected subcarrier, the transmission overhead is kept at a minimum.[7]

[4] See Espax at column 5, lines 62-63.
[5] See Espax at column 5, lines 64-65 and column 6, lines 3-4.
[6] See Espax at column 6, lines 20-22.
[7] See Espax at column 6, lines 21-24.

While the Official Action takes the position that it would have been obvious to modify the teachings of Espax to arrive at the Applicants' claimed advancements, it is clear that such a modification is not obvious as Espax teaches **the exact opposite**. Moreover, this proposed modification would change the basic operating principle of the reference, therefore, this modification cannot be an obvious one. See *In re Ratti*, 123 USPQ 349, 352 (CCPA 1959). Simply stated, there is no reason to modify the Espax reference to abandon the use of probed sub-bands as described, in favor of an adjustment in amplitude and phase of each sub-carrier of an OFDM system as currently claimed.

Accordingly, Applicants respectfully request that the rejection of Claims 5-7, 14, 18, 20 and 21-28 under 35 U.S.C. § 103 be withdrawn.

The Official Action has rejected Claims 6, 7, 14, 18 and 21-26 under 35 U.S.C. § 102 as being unpatentable over Greenstein. The Official Action contends that Greenstein describes all of the Applicants' claimed features. Applicants respectfully traverse the rejection.

Greenstein describes a system for transmitting multi-carrier OFDM signals, including pilot tones. As shown in Fig. 2B, the downlink receiver, or terminal, performs differential phase detection of successive received pilot tones. In operation, the receiving terminal compares the strength of successive received pilot tones, and, determines which of the channels, that is the air channels associated with the respective transmit antenna, is currently carrying the stronger pilot tone. The terminal then sends this information back to the base station to select a corresponding transmission antenna.[8] As the pilot channel is representative of a cluster of subcarriers, the phase adjustment process is performed with respect to the propagation channels depending on the detected phase of the pilot tone. As shown in Fig.

[8] Greenstein at column 4, lines 53-63.

2A, the weighting factors (w1) and (w2) are single values, which are applied to the propagation channel as a whole.

Conversely, in an exemplary embodiment of the Applicants' advancements, a transmission system is provided, in which signals are received through a plurality of antenna elements via a plurality of subcarriers. Each of the subcarrier transmission characteristics are adjusted in accordance with a detected subcarrier channel response vector. In this way, the subcarrier characteristics (e.g., phases) are adjusted to reduce multipath fading in the multicarrier transmission system.

In the Official Action of April 20, 2007, under the heading "Response to Arguments" the Official Action noted that

> Applicant argues that they would be only two pilot tones because the second pilot tone is selected for the tones outside of the correlation bandwidth. However, the patent clearly describes a plurality of pilot tones within the correlation bandwidth. See col. 5, lines 60-63 stating that "The calculation can then be performed with respect to the pilot tones related to the group of tones within the correlation bandwidth. Emphasis added to show the plural nature of the pilot tones.

The solution of Greenstein is to group the tones into subsets of tones smaller than the correlation window and selecting a first pilot tone within each subset. However, with respect to the second group of tones outside of this correlation bandwidth Greenstein teaches selecting a second pilot tone outside of said correlation bandwidth, see in particular the wording "a second pilot tone" at column 5, lines 62 to 63. This distinctive treatment of the tones within and outside of the correlation bandwidth is confirmed for example by column 5 last line and column 6 first line according to which the transmission take account of the analysis of the pilot tones within and outside of said correlation bandwidth. Therefore only

one pilot tone is provided within the group of tones outside of the correlation window, such that each tone will not be analyzed by the terminal.[9]

Accordingly, Applicants respectfully request that the rejection of Claim 6, 7, 14, 18, and 21-26 under 35 U.S.C. § 102 be withdrawn.

The Official Action has rejected Claims 8 and 19 under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax in view of Minami. The Official Action contends that Greenstein or Espax discloses all of the Applicants' claim limitations, with the exception of limiting an adjustment of the magnitude of a sub-carrier signal to an upper threshold. However, the Official Action cites Minami as disclosing this feature of the Applicants' claim and states that it would have been obvious to one of ordinary skill in the art to combine the cited references for arriving at the Applicants' claims. Applicants respectfully traverse the rejection.

As noted above, neither Greenstein nor Espax discloses all of the elements of the Applicants' claims for which they have been asserted. As Minami does not remedy the deficiency discussed above, Applicants respectfully submit that a *prima facie* case of obviousness has not been presented.

Accordingly, Applicants respectfully request that the rejection of Claims 8 and 19 under 35 U.S.C. § 103 be withdrawn.

The Official Action has rejected Claim 15 under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax in view of Ocenasek. The Official Action contends that Greenstein or Espax disclose all of the Applicants' claim limitations with the exception of a software implementation. However, the Official Action cites Ocenasek as describing

[9] It is noted that there is a contradiction between column 5, lines 57 to 60 -- teaching that the downlink tones can be grouped into subsets of M consecutive tones containing a pilot tones wherein M is an odd number such that M* (tone spacing) is less than the correlation bandwidth -- and column 5 lines 62 to 63 -- according to which only one pilot tone is associated with the tones outside of the correlation bandwidth such that for those tones the grouping into subsets of M consecutive tones is not given. Due to this contradiction the skilled person would not be able to deduce the unambiguous teaching of detecting the channel characteristics for each tone of the overall available bandwidth.

this more detailed aspect of the Applicants' claim, and states that it would have been obvious to one of ordinary skill in the art to combine the cited references for arriving at the Applicants' claims. Applicants respectfully traverse the rejection.

As noted above, neither Greenstein nor Espax discloses, or suggests, all of the elements for which they have been asserted. As Ocenasek does not remedy the deficiency discussed above, Applicants respectfully submit that a *prima facie* case of obviousness has not been presented.

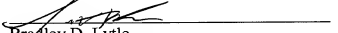
Accordingly, Applicants respectfully request that the rejection of Claim 15 under 35 U.S.C. § 103 be withdrawn.

CONCLUSION

Consequently, in view of the foregoing amendment and remarks, it is respectfully submitted that the present Application, including Claims 2-15, 17-20 and 24-28, is patently distinguished over the prior art, in condition for allowance, and such action is respectfully requested at an early date.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Bradley D. Lytle
Attorney of Record
Registration No. 40,073
Scott A. McKeown
Registration No. 42,866

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)

BDL:SAM\la
I:\ATTY\SAM\PROSECUTION WORK\282452\282452US-AM-DUE20JULY07.DOC